

## AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A method for generating  $(2^k - 2^t)$  first order Reed-Muller codes from  $2^k$  first order Reed-Muller codes based on  $k$  input information bits, for encoding said  $k$  input information bits in an encoder, comprising the steps of:

selecting  $t$  linearly independent  $k^{\text{th}}$  order vectors;  
generating  $2^t$  linear combinations by linearly combining the  $t$  selected vectors;  
calculating  $2^t$  puncturing positions corresponding to the  $2^t$  linear combinations; and  
generating  $(2^k - 2^t)$  first order Reed-Muller codes by puncturing the  $2^t$  puncturing positions from the  $2^k$  first order Reed-Muller codes; and  
encoding said  $k$  input information bits using said  $(2^k - 2^t)$  first order Reed-Muller codes.

2. (Original) The method as claimed in claim 1, wherein the linearly independent  $k^{\text{th}}$  order vectors satisfy a linear independent property represented by,

$$v^0, v^1, \dots, v^{t-1}: \text{ linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \dots + c_1v^1 + c_0v^0 \neq 0, \quad \forall c_0, c_1, \dots, c_{t-1}$$

3. (Original) The method as claimed in claim 1, wherein the  $2^t$  linear combinations are,

$$c^i = (c_{k-1}^i, \dots, c_1^i, c_0^i)$$

where  $i$  indicates an index for the number of the linear combinations.

4. (Original) The method as claimed in claim 1, wherein the  $2^t$  puncturing positions are calculated by converting the  $2^t$  linear combinations to decimal numbers.

5. (Original) The method as claimed in claim 3, wherein the  $2^t$  puncturing positions are calculated by applying the  $2^t$  linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^j \quad t = 1, \dots, 2^t$$

6. (Original) The method as claimed in claim 1, wherein the  $2^k$  first order Reed-Muller codes are codes for encoding the  $k$  input information bits.

7. (Original) The method as claimed in claim 1, wherein the  $2^k$  first order Reed-Muller codes are a coded symbol stream obtained by encoding the  $k$  input information bits with a given code.

8. (Currently Amended) A method for generating  $(2^k - 2^t)$  first order Reed-Muller codes from  $2^k$  first order Reed-Muller codes based on  $k$  input information bits, for encoding said  $k$  input information bits in an encoder, comprising the steps of:

selecting  $t$  linearly independent  $k^{\text{th}}$  order vectors;  
generating  $2^t$  linear combinations by linearly combining the  $t$  selected vectors;  
calculating  $2^t$  puncturing positions corresponding to the  $2^t$  linear combinations;  
selecting one  $k \times k$  matrix out of a plurality of  $k \times k$  matrixes having  $k \times k$  inverse matrixes;  
calculating  $2^t$  new puncturing positions by multiplying each of the  $2^t$  puncturing positions by the selected  $k \times k$  matrix; and  
generating  $(2^k - 2^t)$  first order Reed-Muller codes by puncturing the  $2^t$  new puncturing positions from the  $2^k$  first order Reed-Muller codes; and  
encoding said  $k$  input information bits using said  $(2^k - 2^t)$  first order Reed-Muller codes.

9. (Original) The method as claimed in claim 8, wherein the linearly independent  $k^{\text{th}}$  order vectors satisfy a linear independent property represented by,

$$\begin{aligned} v^0, v^1, \dots, v^{t-1}: & \text{ linear independent property} \\ \Leftrightarrow c_{t-1}v^{t-1} + \dots + c_1v^1 + c_0v^0 & \neq 0, \quad \forall c_0, c_1, \dots, c_{t-1} \end{aligned}$$

10. (Original) The method as claimed in claim 8, wherein the  $2^t$  linear combinations are,

$$c^i = (c_{k-1}^i, \dots, c_1^i, c_0^i)$$

where  $i$  indicates an index for the number of the linear combinations.

11. (Original) The method as claimed in claim 10, wherein the  $2^t$  puncturing positions are calculated by converting the  $2^t$  linear combinations to decimal numbers.

12. (Original) The method as claimed in claim 8, wherein the  $2^t$  puncturing positions are calculated by applying the  $2^t$  linear combinations to an equation given below:

$$P_t = \sum_{j=0}^{k-1} c_j^t 2^t \quad t = 1, \dots, 2^t$$

13. (Original) The method as claimed in claim 8, wherein the  $2^k$  first order Reed-Muller codes are codes for encoding the  $k$  input information bits.

14. (Original) The method as claimed in claim 8, wherein the  $2^k$  first order Reed-Muller codes are a coded symbol stream obtained by encoding the  $k$  input information bits with a given code.

15. (Original) The method as claimed in claim 8, wherein the selected  $k \times k$  matrix A is given as follows:

$$A = \begin{bmatrix} 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

16. (Previously Presented) An apparatus for encoding  $k$  input information bits in a transmitter for a CDMA (Code Division Multiple Access) mobile communication system, comprising:

an encoder for encoding the  $k$  input information bits with  $2^k$ -bit first order Reed-Muller codes, and outputting  $2^k$  coded symbols; and

a puncturer for puncturing the coded symbols in puncturing positions corresponding to at least  $2^t$  linear combinations, obtained from  $t$  linearly independent  $k^{\text{th}}$  order vectors, from the  $2^k$  coded symbols, and outputting  $(2^k - 2^t)$  coded symbols.

17. (Original) The apparatus as claimed in claim 16, wherein the linearly independent  $k^{\text{th}}$  order vectors satisfy a linear independent property represented by,

$$v^0, v^1, \dots, v^{t-1}: \text{linear independent property}$$

$$\Leftrightarrow c_{t-1}v^{t-1} + \dots + c_1v^1 + c_0v^0 \neq 0, \quad \forall c_0, c_1, \dots, c_{t-1}$$

18. (Original) The apparatus as claimed in claim 16, wherein the  $2^t$  linear combinations are,

$$c^i = (c_{k-1}^i, \dots, c_1^i, c_0^i)$$

where  $i$  indicates an index for the number of the linear combinations.

19. (Original) The apparatus as claimed in claim 16, wherein the  $2^t$  puncturing positions are calculated by converting the  $2^t$  linear combinations to decimal numbers.

20. (Original) The apparatus as claimed in claim 18, wherein the  $2^t$  puncturing positions are calculated by applying the  $2^t$  linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^j \quad t = 1, \dots, 2^t$$

21. (Previously Presented) An apparatus for encoding  $k$  input information bits in a transmitter for a CDMA mobile communication system, comprising:

a code generator for puncturing  $2^t$  number of bits, which are positioned in corresponding linear combinations of  $t$  linear independent  $k^{\text{th}}$  order vectors, from  $2^k$ -bit first order Reed-Muller code bits, and outputting  $(2^k - 2^t)$ -bit first order Reed-Muller codes; and

an encoder for encoding the  $k$  input information bits with the  $(2^k - 2^t)$ -bit first order Reed-Muller codes, and outputting  $(2^k - 2^t)$  coded symbols.

22. (Original) The apparatus as claimed in claim 21, wherein the linearly independent  $k^t$  order vectors satisfy a linear independent property represented by,

$$v^0, v^1, \dots, v^{t-1}: \text{linear independent property}$$

$$\Leftrightarrow c_{t-1}v^{t-1} + \dots + c_1v^1 + c_0v^0 \neq 0, \quad \forall c_0, c_1, \dots, c_{t-1}$$

23. (Original) The apparatus as claimed in claim 21, wherein the  $2^t$  linear combinations are,

$$c^i = (c_{k-1}^i, \dots, c_1^i, c_0^i)$$

where  $i$  indicates an index for the number of the linear combinations.

24. (Original) The apparatus as claimed in claim 21, wherein the  $2^t$  puncturing positions are calculated by converting the  $2^t$  linear combinations to decimal numbers.

25. (Original) The apparatus as claimed in claim 23, wherein the  $2^t$  puncturing positions are calculated by applying the  $2^t$  linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^j \quad t = 1, \dots, 2^t$$

26. (Original) The apparatus as claimed in claim 21, wherein the encoder comprises:  
 k multipliers each for multiplying one input information bit out of the  $k$  input information bits by one  $(2^k - 2^t)$ -bit first order Reed-Muller code out of the  $(2^k - 2^t)$ -bit first order Reed-Muller codes, and outputting a coded symbols stream comprised of  $(2^k - 2^t)$  coded symbols; and  
 a summer for summing up the coded symbol streams output from each of the  $k$  multipliers in a symbol unit, and outputting one coded symbol stream comprised of  $(2^k - 2^t)$  coded symbols.

27. (Original) A method for receiving  $(2^k - 2^t)$  coded symbols from a transmitter and decoding  $k$  information bits from the  $(2^k - 2^t)$  received coded symbols, comprising the steps of:  
 selecting  $t$  linearly independent  $k^t$  order vectors, and calculating positions corresponding to  $2^t$  linear combinations obtained by combining the  $t$  selected vectors;

outputting  $2^k$  coded symbols by inserting zero (0) bits in the calculated positions of the  $(2^k - 2^t)$  coded symbols;

calculating reliabilities of respective first order Reed-Muller codes comprised of the  $2^k$  coded symbols and  $2^k$  bits used by the transmitter; and

decoding the  $k$  information bits from the  $2^k$  coded symbols with a first order Reed-Muller code having the highest reliability.

28. (Original) The method as claimed in claim 27, wherein the linearly independent  $k^{\text{th}}$  order vectors satisfy a linear independent property represented by,

$$v^0, v^1, \dots, v^{t-1}: \text{linear independent property}$$
$$\Leftrightarrow c_{t-1}v^{t-1} + \dots + c_1v^1 + c_0v^0 \neq 0, \quad \forall c_0, c_1, \dots, c_{t-1}$$

29. (Original) The method as claimed in claim 27, wherein the  $2^t$  linear combinations are,

$$c^i = (c_{k-1}^i, \dots, c_1^i, c_0^i)$$

where  $i$  indicates an index for the number of the linear combinations.

30. (Original) The method as claimed in claim 27, wherein the  $2^t$  puncturing positions are calculated by converting the  $2^t$  linear combinations to decimal numbers.

31. (Original) The method as claimed in claim 29, wherein the  $2^t$  puncturing positions are calculated by applying the  $2^t$  linear combinations to an equation given below:

$$P_i = \sum_{j=0}^{k-1} c_j^i 2^j \quad t = 1, \dots, 2^t$$

32. (Previously Presented) An apparatus for receiving  $(2^k - 2^t)$  coded symbols from a transmitter and decoding  $k$  information bits from the  $(2^k - 2^t)$  received coded symbols, comprising:  
an inserter for selecting  $t$  linearly independent  $k^{\text{th}}$  order vectors, calculating positions corresponding to  $2^t$  linear combinations obtained by combining the  $t$  selected vectors, and outputting  $2^k$  coded symbols by inserting predetermined bits in the calculated positions of the  $(2^k - 2^t)$  coded symbols;

an inverse fast Hadamard transform part for calculating reliabilities of respective first order Reed-Muller codes comprised of the  $2^k$  coded symbols and  $2^k$  bits used by the transmitter, and decoding the  $k$  information bits from the  $2^k$  coded symbols with the first order Reed-Muller codes corresponding to the respective reliabilities; and

a comparator for receiving in pairs the reliabilities and the information bits from the inverse fast Hadamard transform part, comparing the reliabilities, and outputting information bits pairing with the highest reliability.